GUIDE TO

THIRTY-SECOND ANNUAL FIELD CONFERENCE

OF THE

SECTION OF GEOLOGY

OF THE

OHIO ACADEMY OF SCIENCE

April 20, 1957

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GEOLOGY OF THE CENTRAL LAKE PLAINS AREA

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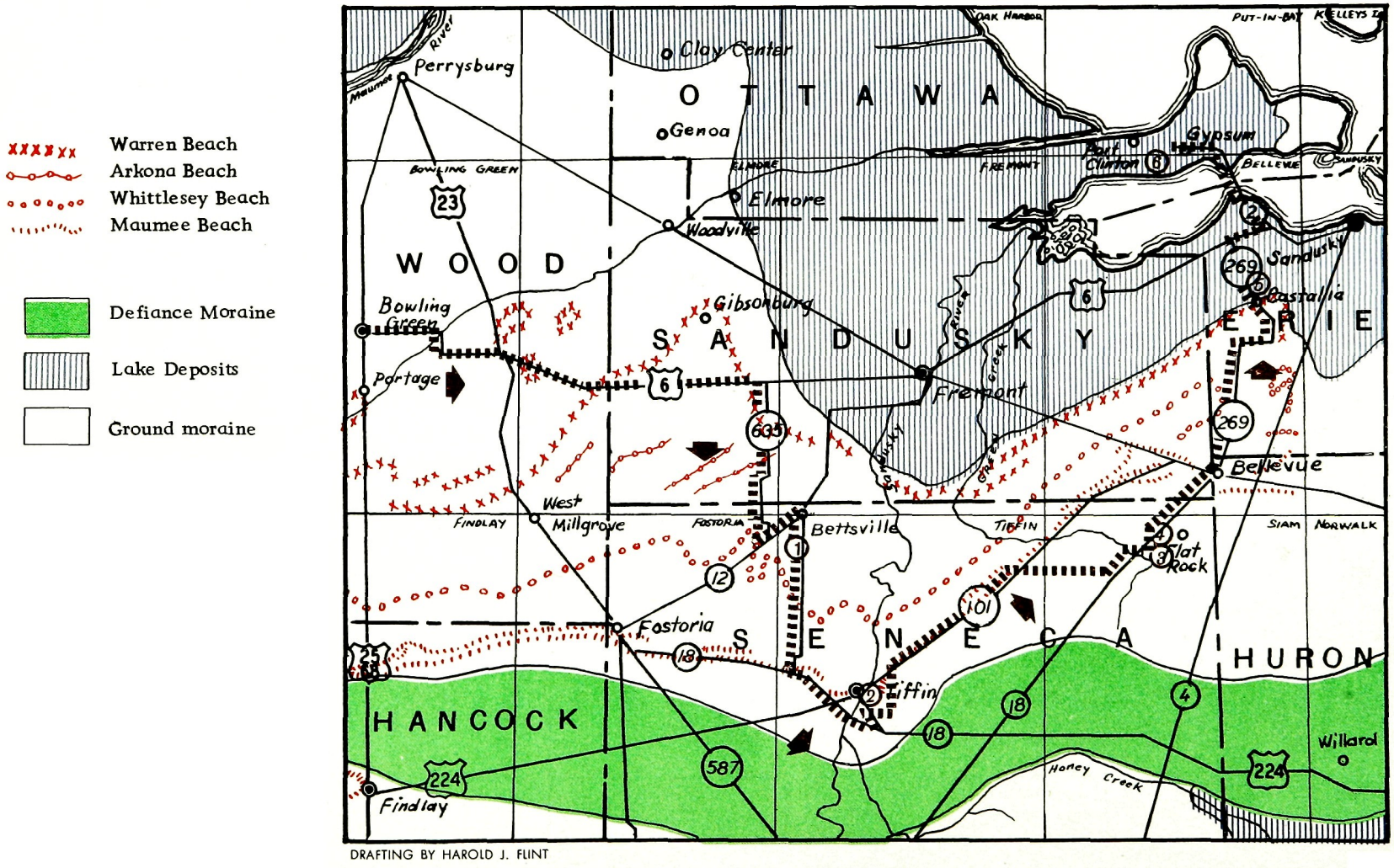
STRATIGRAPHIC SECTION FOR CENTRAL LAKE PLAINS AREA

SYSTEM	SERIES	GROUP	FORMATION		APPROXIMATE THICKNESS (Feet)	STRATIGRAPHIC LOCATION OF STOPS
Quaternary	Pleistocene	Wisconsin	Mankato		Total thickness of Pleistocene is 0 - 100±	
			Glacial Lake Erie deposits			
			Glacial Lake Lundy deposits			
			Glacial Lake Warren deposits			
			Glacial Lake Wayne deposits			
			Cary			
			Glacial Lake Whittlesey deposits			
			Glacial Lake Arkona deposits			
			Glacial Lakes Maumee deposits			Pit at mileage 87.6 and STOP 2
			Wisconsin drift with deposits of one contemporaneous lake			2
		pre-Wisconsin	Drift ?			
		disconformity				
Devonian	Senecan		Ohio shale		600 +	
			Prout limestone		10	
			Plum Brook shale		35	
	Ulsterian		Columbus limestone		60	3, 4
		Detroit River	Monroe	Lucas dolomite	40	
				Amherstburg dolomite	60	5
		disconformity				
Silurian	Cayugan	Bass Islands	Monroe	Raisin River dolomite	55	
				Put-In-Bay dolomite	35	
				Tymochtee dolomite	100 +	6
				Greenfield dolomite	50	1
		disconformity				
	Niagaran		Guelph dolomite		100 +	1



DRAFTING BY HAROLD J. FLINT

PLEISTOCENE GEOLOGY OF THE CENTRAL LAKE PLAINS AREA

LEGEND

DEVONIAN
Ulsterian

Dc
Columbus limestone

Ddt
Detroit River dolomite undifferentiated

m
Monroe dolomite

-Disconformity-

Sbi
Bass Islands dolomite undifferentiated

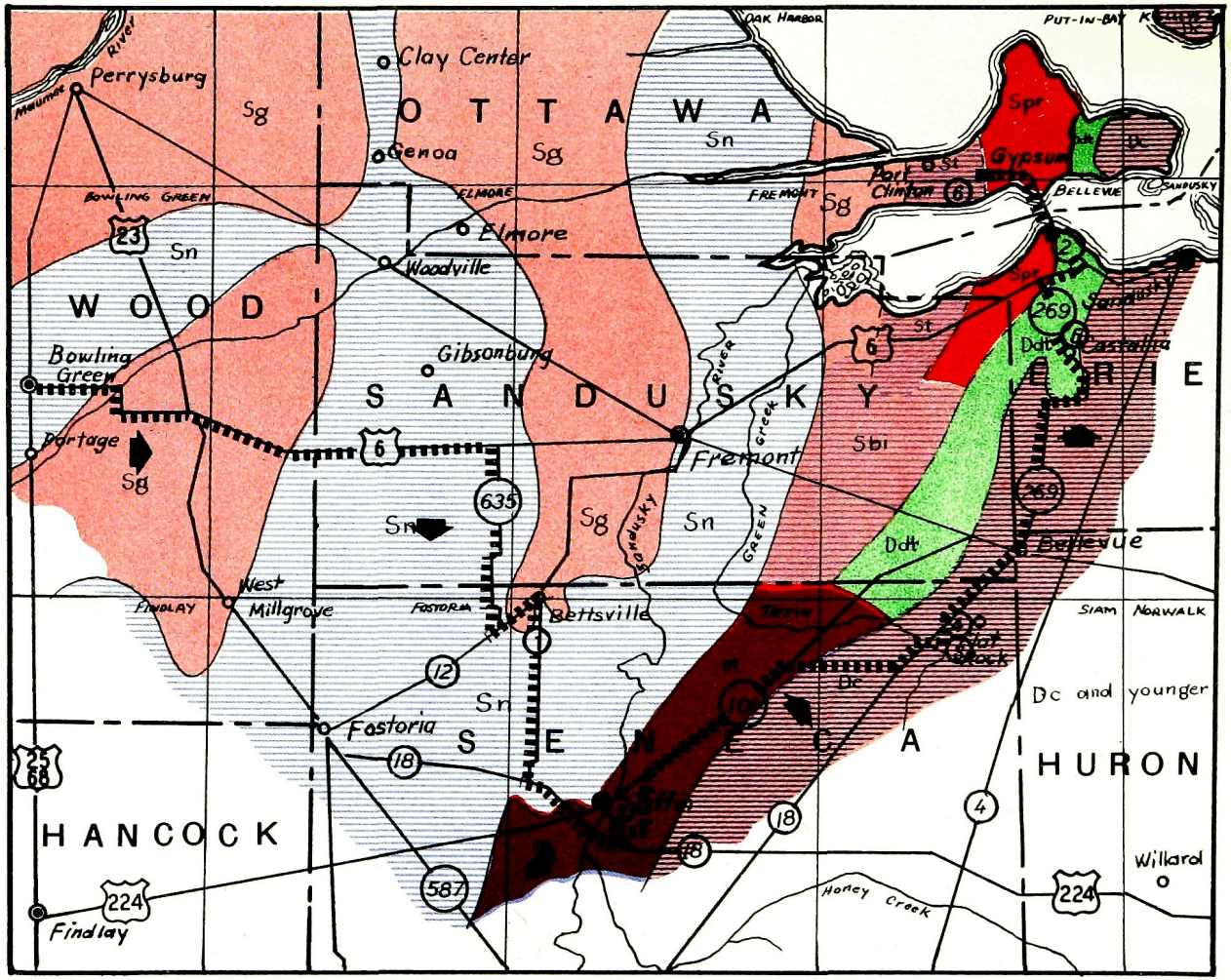
Spr
Raisin River and Put-In-Bay dolomites

St
Tymochtee dolomite

Sg
Greenfield dolomite

SILURIAN
Niagaran / Cayugan

Sn
Guelph dolomite



DRAFTING BY HAROLD J. FLINT

Drawn from data supplied by Dr. J. E. Carman

BEDROCK GEOLOGY OF THE CENTRAL LAKE PLAINS AREA

GEOLOGY OF THE CENTRAL LAKE PLAINS AREA

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Assembly - 8:00 A.M. in parking lot north of Ridge Street, south of Overman Hall, Bowling Green State University campus. Extra guidebooks and topographic maps will be available at this time. A few tickets for box lunches will also be available to those who have not purchased them previously.

Drivers - Please mark your cars with the paper markers provided. Stay in line and be careful; some of the roads we will cross are heavily-travelled main highways.

ALL PERSONS ARE URGED TO BE CAREFUL, ESPECIALLY IN QUARRIES.

Please be in your cars and ready to leave promptly at 8:15.

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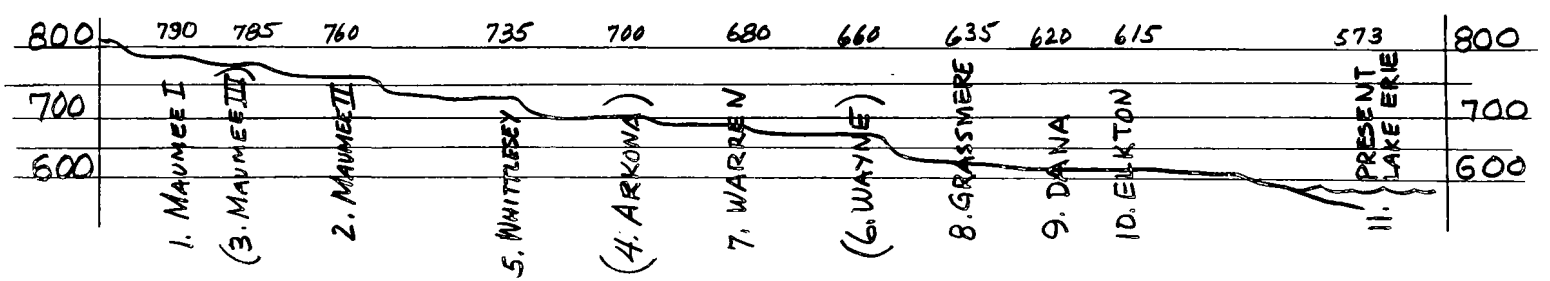
Mileage		Road Log
Individual	Total	
0.0	0.0	Turn left out of parking lot. Hill in cemetary on left is a dune on the Warren beach ridge. We are on the Bowling Green quadrangle.
0.5	0.5	Turn right onto Yount Road.
0.3	0.8	Turn left - with care - onto Wooster Street (US 6). We will proceed eastward on US 6 for about 20 miles. We are travelling on the Warren Lake bottom, which here was about 5 - 10 feet deep. For those who may not remember the glacial lake sequence too well, a chart of the major glacial lakes in the Erie basin is included on next page.
3.0	3.8	North Branch Portage River.
4.0	7.8	Junction of US 6 with US 23; continue eastward on US 6. Note low hills to north. These are dunes blown from sand of the Warren beach, which formed a ring around what must have been a low island in the Warren lake.
		Leave Bowling Green quadrangle; enter Elmore quadrangle.
1.5	9.3	This hill is composed of sand associated with the Warren beach, which formed around a small island. Carney reports dunes here, but no dune structure can now be observed.
3.7	13.0	US 6 crosses the Warren beach, which here is trending northeast-southwest. Hills ahead and to the right are dunes blown up above Warren lake level. After passing through dune belt, we will be on the floor of Lake Arkona, which formed three lake stages previous to the Warren (see chart).

MAJOR PLEISTOCENE LAKE LEVELS OF THE ERIE BASIN IN OHIO

All the major Pleistocene lake beaches of the Erie basin in Ohio are listed in the chart below, arranged chronologically from the bottom up. For each is given, also, the elevation of the beach, the geologic reason for the change in lake level, the outlet of the lake, and the moraine (if any) built at the same time. The names of the lakes with the best-defined beaches are underlined. The diagram at the bottom of the page is a generalized cross-section, drawn to illustrate the topographic sequence of these lake beaches. Beaches later covered by a higher water level are in parentheses.

	Order	Lake	Elevation	Reason for change in level	Outlet	Contemporaneous moraine
	11	Erie	(580-540') 573'	First continued ice retreat and then isostatic uplift	Niagara River	
	10	Elkton (Lundy)	615'	Continued ice retreat	Mohawk River, (N.Y.)	
	9	Dana (Lundy)	620'	Continued ice retreat	Mohawk River (N.Y.)	
MANKATO	8	Grassmere (Lundy)	635'	Retreat of ice	Mohawk River (N.Y.)	
	7	Warren	680'	Continued ice advance	Grand River, Michigan	
	6	Wayne	660'	Advance of the ice	Mohawk River, N.Y.	
				EXTENSIVE RETREAT OF ICE		
	5	Whittlesey	735'	Readvance of ice	Grand River, Michigan	Port Huron (Michigan)
	4	Arkona	700'	Erosion of outlet	Grand River, Michigan	Galt (Ontario)
CARY	3	Maumee III	785'	Readvance of ice	Imlay, Michigan	Lake Border
	2	Maumee II	760'	Continued retreat of ice	Imlay, Michigan	
	1	Maumee I (present only in western lake basin	790'	Formation of first major depression between ice and state divide	Wabash River, Indiana	Defiance



0.4	13.4	Junction 199; continue straight east on US 6. Note Warren beach dunes to southeast.
2.0	15.4	Rollersville.
0.6	16.0	Low northeast-southwest-trending rise is Arkona beach.
1.9	17.9	Road crosses low rise formed by bedrock "high". Carney maps a low Arkona beach circling around the north edge of this feature.
0.6	18.5	Junction with US 6 Truck Route; continue straight east.
1.3	19.8	Helena.
1.3	21.1	Turn right onto Ohio 635. A quarter of a mile back (west) of this turn, we crossed the position of the Warren shoreline, now oriented almost north-south. About a mile south of this intersection, this low beach ridge may be seen passing under our route and extending on to the south, east of the road. The beach may be traced on the topographic map from just east of Millersville north to a point one mile east of Helena, north to and around the north side of the Gibsonburg bedrock "high", and thence southwest on the 680-foot contour through Bradnor (the beach we crossed at mileage 13.0).
0.8	21.9	Old oil field. Production in this field, which was developed about 1900, was from vuggy dolomitic zones in the Trenton, at a depth of about 1,200-1,300 feet. Initial production was about 5 - 50 barrels per day, forced up by water-drive. When the oil was depleted, water began rising, so the wells were plugged. (Information provided by George Shearrow, Oil and Gas Section, Ohio Division of Geological Survey.)
1.3	23.2	Millersville quarry (Guelph) on right.
1.7	24.9	Arkona beach ridge.
0.4	25.3	Turn right onto Ohio 635.
0.5	25.8	Turn left. Sand of small rises is from Arkona beach.
2.0	27.8	Seneca County line. Continue south.
		Leave Elmore quadrangle; enter Fostoria quadrangle.
0.8	28.6	Kansas. Stay on Ohio 635 through town.
		Kansas is on the northern tip of a Lake Whittlesey promontory. The Whittlesey beach may be observed on the Fostoria quadrangle following the 730-foot contour from five miles northwest of Fostoria eastward through Longley and Amsden to Kansas, where the shoreline bends sharply southward to Angus. For the next mile and a half, our route follows this section of the Whittlesey beach. From Angus, the beach again trends toward the northeast.
2.0	30.6	Turn sharp left onto Ohio 12 at junction.
1.0	31.6	Note bedrock exposure (Guelph?) on right.
		Leave Fostoria quadrangle; enter Tiffin quadrangle.

2.0 33.6 Bettsville. Turn right on Ohio 113.

0.4 34.0 Turn right on Seneca County road 31.

0.4 34.4 Rise onto prominent rock "high" (Guelph). Note woods, swamps, and boulders, all of which are characteristic of these "highs".

0.6 35.0 Turn left, just across railroad.

1.3 36.3 Turn left over railroad and left again into Basic Refractory plant area. A short stop must be made at office. Please keep cars to right and out of roadway as much as possible. Stay in line! Then proceed ahead down into quarry. Note reef structure in wall along roadway on left as we descend into quarry.
Watch guides on road for parking instructions.

0.5 36.8 STOP I - Basic Refractories Quarry. Length of time for stop, 1 hour.

In this and other quarries BE CAREFUL; watch out for loose rocks, ESPECIALLY WHEN OTHERS ARE BENEATH YOU !

This quarry is in the Guelph dolomite. The lowermost beds of the Greenfield are exposed at the top of the western section, but have not been identified elsewhere in the quarry cuts. Test drilling reveals the presence of the Greenfield just east of the quarry, however, showing that the Guelph - Greenfield contact is higher in the main area of the quarry than in most of the surrounding area. "Domed" contacts like this are apparently present in a number of the Guelph quarries of northwestern Ohio. Drift is usually thin over these rises.

The section revealed in the Basic Refractories Quarry (as taken from Stout, Ohio Geological Survey Bull. 42) is as follows:

	Feet
Drift (Till)	4 (0-15)
Monroe (Bass Islands - Greenfield) Dolomite, rather regularly bedded, beds massive except near top where they are thin to medium. Some beds finely crystalline and dense, others coarsely crystalline and cavernous, light to dark gray color, few fossils	27
Disconformity	
Shale, soft, argillaceous, from less than one inch to several feet in thickness, gray to greenish in color	1
Niagara (Guelph) Dolomite, very massive, open cavernous texture, light color, large fossils common.	30

Leave quarry by same route as we entered.

0.5 37.3 Basic Refractories entrance. Turn right.

1.3 38.6 Turn left.

2.1	40.7	Note Whittlesey beach ridge to right.
1.1	41.8	Cross diagonal road; continue straight south.

Whittlesey beach crosses our route here and follows diagonal road to the southeast towards the Sandusky River. The beach has been circling a bedrock "high" to the west. Note bedrock exposures ahead.

0.4	42.2	Jog right, then left; continue south.
1.3	43.5	Bridge over East Branch Wolf Creek. Note bedrock exposures.
0.9	44.4	Stop sign. Turn right on County road 48.
0.5	44.9	Turn left on county road by church.
1.0	45.9	Turn right.
0.3	46.2	Stop sign. Junction with Ohio 18. Turn left with care.

We are now on the Maumee beach ridge, which is oriented east-west here and which is followed by Ohio 18 from Fostoria to Tiffin.

0.6	46.8	Middle Branch of Wolf Creek. Note old quarry on right.
1.0	47.8	Junction with US 224. Cross with care and continue slowly ahead on new bypass 224. This new bypass may be added to your topographic map by drawing a smooth curve, convex to the southwest, from the three-way intersection in the northern part of section 26 west of Tiffin southeast to the three-way intersection in the middle of section 32 south of Tiffin.

Note cuts on both sides of road. The complete section once exposed here showed:

	Feet
Maumee III beach gravel (now stripped off).	?
Till	3
Sand, brown	4
Clay, gray, with some "salt and pepper" sand lenses . . .	15+

This section will be discussed at Stop II.

1.3	49.1	Further exposures of the same section as above, but lacking the gravel at the top.
0.1	49.2	Junction with Ohio 53. Continue straight ahead.
0.1	49.3	Cross Sandusky River.
0.6	49.9	Cross County road 19 (the north-south township line).
0.9	50.8	Cross Ohio 231.
1.3	52.1	Junction with Ohio 100; turn sharp left. (Ohio 100 is the diagonal road which runs from Melmore to Tiffin on the topographic map).
1.4	53.5	Tiffin city limits. Convent on left.

0.1 53.6 **Turn right** (this road is not shown on topographic map).

0.5 54.1 Stop sign at junction of County road 36. Turn left.

0.3 54.4 **Turn right** into Hedges-Boyer Park. Keep to right around circle.

0.2 54.6 **Turn right** just beyond swimming pool and go down hill carefully.

0.2 54.8 Cross ford over Rock Creek and park off road.

STOP II - Pleistocene stratigraphy in Hedges-Boyer Park. Length of time for stop, 30 minutes.

Anyone preferring not to climb the steep bank on the opposite side of the creek will be able to hear adequately from this side.

The section exposed in this cut shows:

	Feet
Till	3
Sand, with clay lenses near middle of section. Sand near base of section is a "salt and pepper" quicksand (don't get stuck!)	15+

The till is part of a thin sheet which thickens southward and which can be traced onto the crest of the Defiance moraine in southern Seneca County.

The sand and clay seen here (which are similar to the beds exposed along bypass US 224 at mileages 47.8 and 49.1) are apparently part of a large, pre-Defiance lake (Maumee I?). To date, the lake has been traced roughly throughout the southern two-thirds of the Tiffin quadrangle, from the west edge of the quadrangle to the Bloomville quarry at the east, and from a point four miles northwest of Tiffin in Spicer Creek south to the Sandusky River.

Leave Stop II by continuing around circle in valley, keeping to left. Note terraces. Drive up hill to left and out to park entrance by which we entered.

0.6 55.4 **Turn** left out of park.

0.5 55.9 Cross bridge over Rock Creek. Note bedrock (Bass Islands dolomite) in creek bed to left. Pass cemetary on left.

1.3 57.2 Junction with County road 15. Turn left.

3.3 60.5 Junction with Ohio 101. Turn right with caution. For the last half mile we have been riding on the easternmost of three short north-south spits on the west end of the Maumee beach. This beach extends to the northeast and is followed by our route, Ohio 101.

1.8 62.3 Cross Spicer Creek, which has cut through the Maumee beach in post-Maumee time.

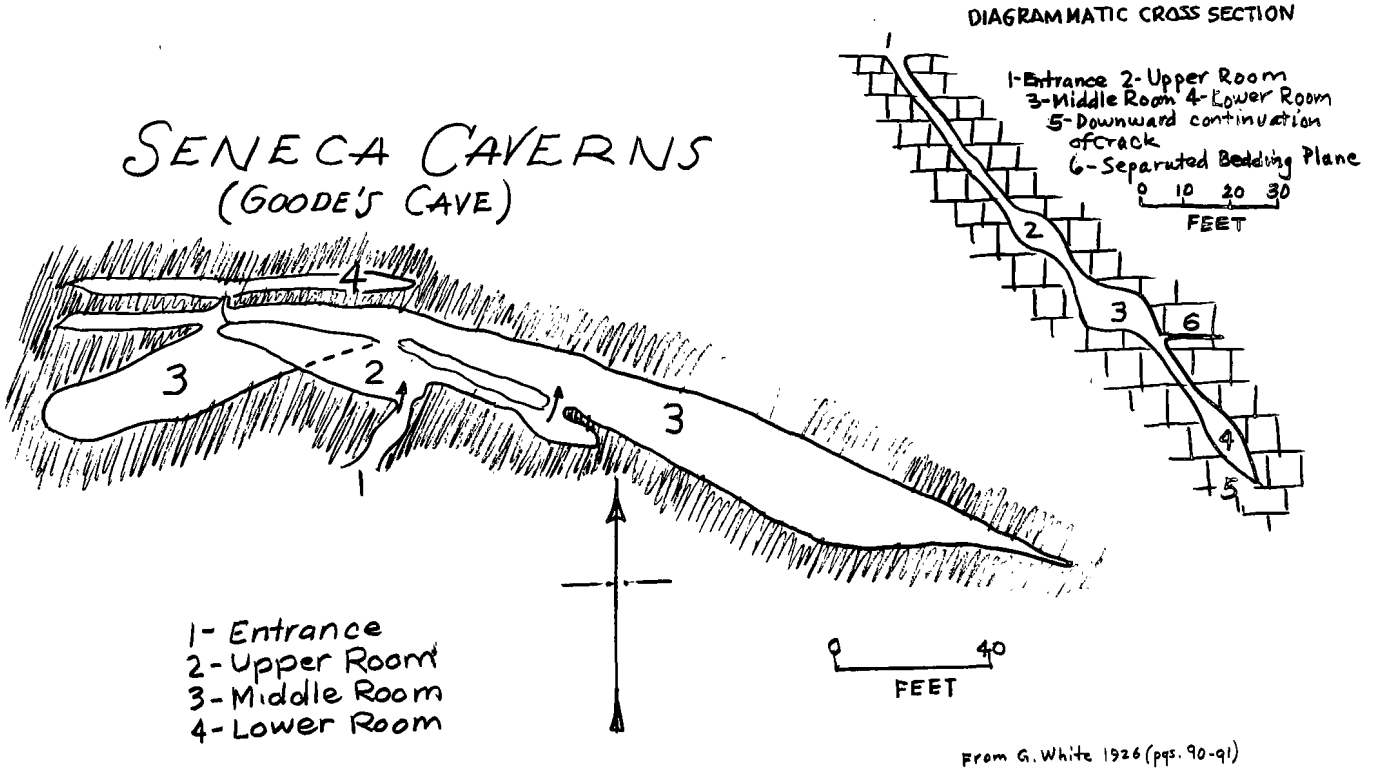
0.7 63.0 Church and cemetary on right. Note low ridge to left that was probably a sand bar in the Maumee lake. This bar may be identified on the topographic map in sections 35 and 36 and also, to a lesser degree, north of Lowell.

1.8	64.8	Cross Sugan Creek twice. Sugar Creek has also breached the Maumee beach ridge.
1.9	66.7	Lowell. Note low ridge about a mile away to the north. This is the Whittlesey beach which may be recognized as the linear feature extending along the 730' contour northeast-southwest through Watson. Both the Maumee and the Whittlesey beaches are well developed in this area.
0.6	67.3	Turn right onto County road 32.
		Leave Tiffin quadrangle; enter Siam quadrangle.
6.0	73.3	Stop sign. Junction with Ohio 18. Turn left with care.
1.4	74.7	Turn right. Go east, following signs to Seneca Caverns.
2.0	76.7	Turn right at Seneca Caverns.

STOP III - Lunch. Length of time for stop, 1 hour.

Box lunches will be distributed here to those who purchased tickets. Plenty of coffee for all. Those who do not have lunches may wish to go north and east into Bellevue, rejoining us here or at the next stop.

Those who wish to make a short trip through the caverns should eat quickly, because the group will leave promptly at the end of the hour. Caverns are privately owned, so there will be a fee. The cave, which is developed on three levels, is in a fissure in the Columbus limestone, but is almost entirely lacking in dripstone features.



From G. White 1926 (pgs. 90-91)

Turn left from the Seneca Caverns.

0.3 77.0 Turn right

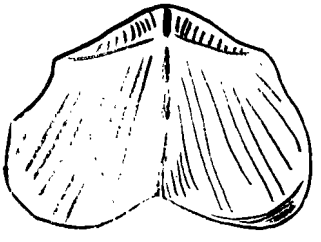
0.3 77.3 Turn right into Northern Ohio Stone Company quarry. Park with care.

STOP IV - Northern Ohio Stone Company quarry near Flat Rock.
Length of time for stop, 1 hour.

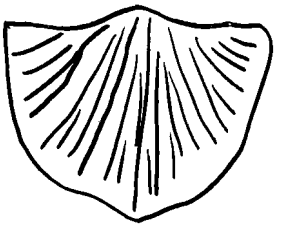
This quarry is in the upper part of the Columbus limestone and provides excellent fossil collecting. Look for the following:

Macrospirifer (Spirifer) macrothyris
Paraspirifer (Spirifer) accuminatus
Brevispirifer (Spirifer) gregareous
Megastrophia (Stropheodonta) hemispherica
Stropheodonta demissa
Strophonella ampla
Atrypa sp.
Phacops sp.
Heliophyllum corniculum
Synaptophyllum simcoense
Pleurodictyum problematicum (one of few localities where this button-like coral is found)
Trochiliscus sp. (a charq-like form)

Brevispirifer

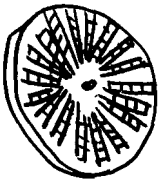


Paraspirifer



Stropheodonta

Heliophyllum



Pleurodictyum

Turn right going out of quarry.

Leave Siam quadrangle; enter Bellevue quadrangle.

1.3 78.6 Stop sign. Junction with Ohio 18. Turn right.

For the next two miles we pass through an area characterized by sinkhole depressions and small dunes. The sand forming the dunes was blown from the Maumee shore which passes through Bellevue and is oriented generally east-west across the southern part of the quadrangle. Water, draining into these sinkholes, passes through an underground solution system and reappears in the springs near Castalia.

2.1 80.7 Bellevue.

0.5 81.2 Junction with Ohio 269. Turn left and follow Ohio 269 toward Castalia.

2.2 83.4 Road passes through a fairly large sinkhole (visible on topographic map).

0.9 84.3 Quarry (Delaware limestone?).

0.4 84.7 Note dunes.

1.0 85.7 Note Sandusky Crushed Stone Company quarry (in Columbus and Delaware limestones) at Parkertown off to right.

0.9 86.6 Cross Ohio Turnpike.

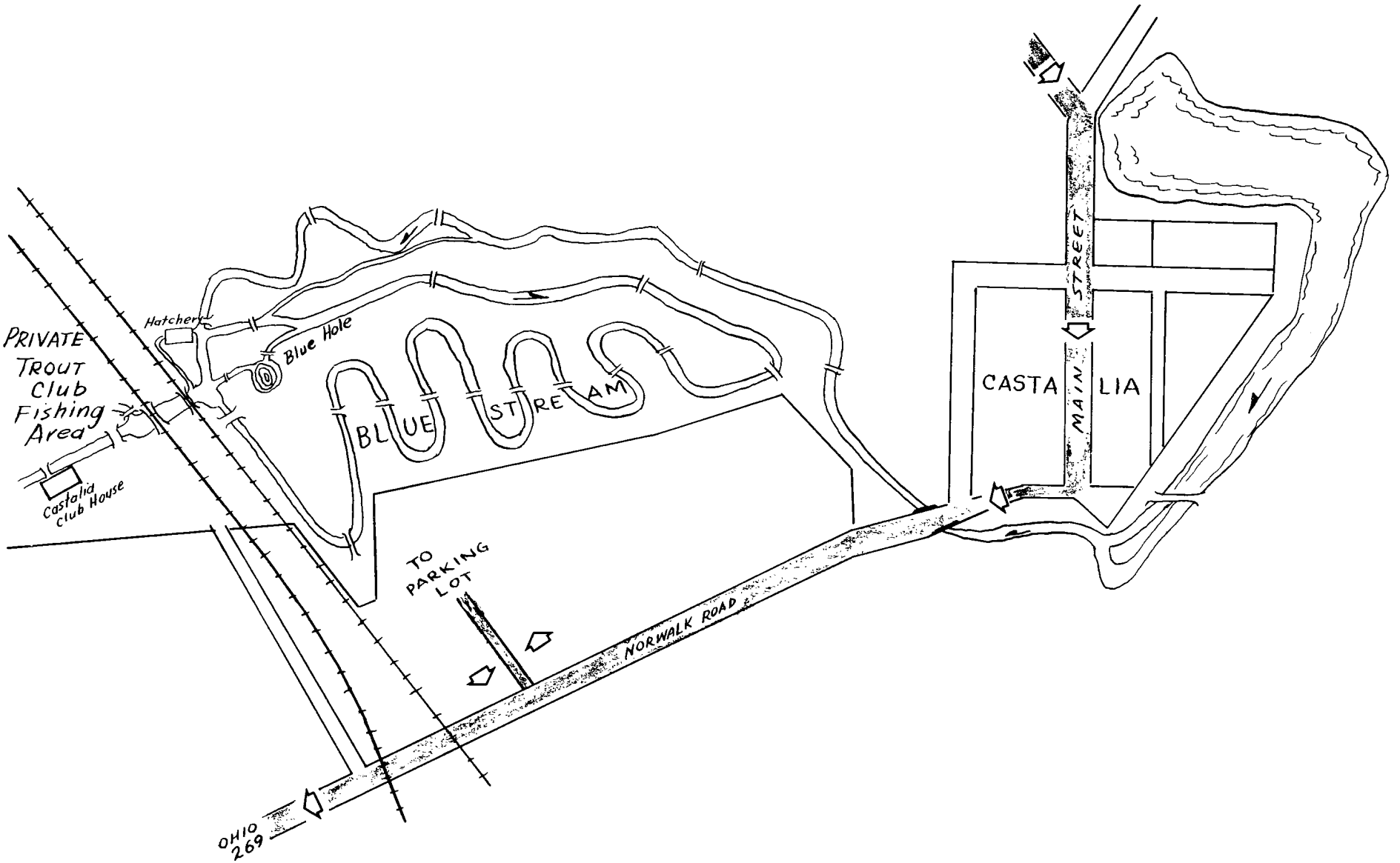
Four miles east of here, and just east of Ohio 4 overpass over the turnpike, Pleistocene wood was found by the contractors building the turnpike. The section containing wood occurred in a small channel cut in the bedrock and was as follows:

	Feet
Whittlesey Beach gravels (now removed)	?
Laminated silts and fine sands . . . . {Above water} . .	1
Peat with logs, twigs, and leaves . . . {Arkona time} . .	1
Sandy alluvium	1
Blue calcareous clay of glacial Maumee Lake	2
Pebbly clay, probably till, calcareous, with angular fragments of limestone	2+
Bottom of channel cut is covered; Bedrock (Delaware limestone?) is present at either side of this channel and below it.	8

Wood from the peaty zone was dated by radiocarbon means at 12,920 ± 400 years (W-430). This agrees with other post-ice dates from Sandusky, Cuyahoga, and Williams Counties.

1.0 87.6 Turn left carefully onto dirt road toward hill. This is a "drive-thru" stop. Drive slowly.

This hill, which doubtless has a bedrock core, was an island in both the Maumee and Whittlesey lakes. Beaches of both lakes were formed around it, the Maumee above the Whittlesey level. This pit is in the Maumee beach. Because of the immediate availability of local materials by the waves, most of the beach material is composed of large slabs of the bedrock, which tends to form slabs because of its thin-bedded character. Note the size and shape of these slabs and their arrangement as "beach shingle". Also note the topographic expression of the Maumee beach and its relation to the depth of the soil profile.

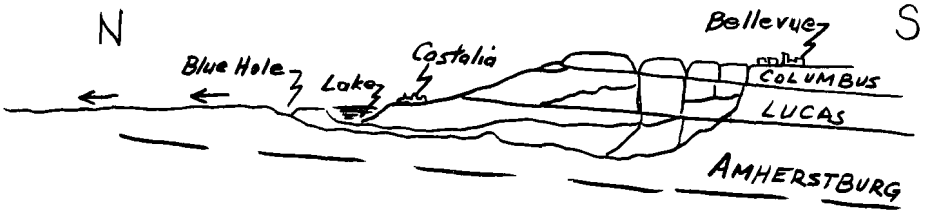

PRIVATE
TROUT
Club
Fishing
Area
Castalia
Club House
Hatchery
Blue Hole
BLUE STREAM
TO
PARKING
LOT
NORWALK ROAD
OHIO
269
MAIN STREET
CASTALIA

0.6	88.2	Turn left out of dirt road onto Ohio 269 again.
1.0	89.2	Turn right onto Parker Road. Note large sinkhole to left into which road descends shortly after turn. Sinkhole may be observed on topographic map. Also note old New England style rock fences.
0.9	90.1	Road dips into the southern end of another large sinkhole. Note size and depth of this sinkhole on topographic map.
0.5	90.6	Turn left.
1.0	91.6	Road dips into northeast arm of same large sinkhole.
0.4	92.0	Turn left.
0.4	92.4	Stop light in Castalia. Keep left. Note dune sand back to right.
0.2	92.6	Stop sign. Turn left. Note lake on left. This is the large main spring that feeds the creek that flows through the Blue Hole area. The Blue Hole is also a small feeder, but its volume is considerably less than that of this lake. (Note accompanying map)
0.3	92.9	Stop light. Turn right.
0.3	93.2	Blue Hole. Turn right.

STOP V - Blue Hole. Length of time for stop, 40 minutes.

This is a commercially-owned feature, so there is a charge. You may go in or not, as you wish. A brief discussion will be held first in the parking lot area.

The Blue Hole is the spring exit for a small flow of underground water. The lake seen in the town of Castalia has the same origin, but carries considerably more volume of water. The collecting area for this water is on the Devonian cuesta of the Bellevue area, where surface water flows underground through sinkholes like those we observed. The water follows a series of solution passageways through the Columbus limestone, the Lucas dolomite, and down into the Amherstburg dolomite, which here is quite porous, thus providing the best channels.



Leave Blue Hole. Turn right.

1.7 94.9 The road at left leads back to the active marl diggings. It is possible to drive back to the area, but space for turning around is not adequate for a large number of cars. Pits on the east side of the road are diggings now abandoned and, in many cases, flooded. This general area has been made into the Resthaven Wildlife Park by the Ohio Division of Wildlife.

1.2 96.1 Turn right, staying on Ohio 269.

0.7 96.8 Turn left, again staying on Ohio 269.

2.0 98.8 Junction with Ohio 2. Turn left on Ohio 2. Cross Sandusky Bay on bridge. This broad expanse of water is not deep, averaging only 7 - 8 feet deep in the deepest parts.

2.5 101.3 Keep left on Ohio 2.

3.1 104.4 Turn left toward Celotex gypsum plant.

0.3 104.7 Turn right into Celotex gypsum plant.

0.3 105.0 **STOP VI** - Celotex Gypsum quarry in Tymochtee dolomite. Length of time for stop, 1 hour.

This quarry is in the Tymochtee dolomite. To show the relationship of the gypsum to the dolomite, the log of a 2-inch test core drilled to a depth of 500 feet on the property of the Celotex Corporation is tabulated below. Seams 2, 3, 4, and 5 are present in the quarry. Note that gypsum and anhydrite are present to a depth of 463 feet. A gradational change in color and lithology that takes place at about this depth is interpreted as the contact between the Tymochtee and Greenfield dolomites.

	Top Feet	Bottom Feet
Unconsolidated earth	0.0	23.5
Dolomite	23.5	26.0
Gypsum	26.0	26.5
Dolomite	26.5	28.6
Gypsum - #2 seam	28.6	34.2
Dolomite	34.2	38.1
Gypsum disseminated in dolomitic shale - #3 seam	38.1	40.6
Gypsum	40.6	41.8
Dolomite	41.8	44.2
Gypsum disseminated in dolomitic shale - #4 seam	44.2	48.6
Alternate strata of white gypsum and gray dolomite - #5 seam	48.6	65.4
Dolomite	65.4	68.5
Gypsum - #5A seam	68.5	70.7
Dolomite	70.7	87.2
Gypsum	87.2	87.9
Dolomite	87.9	96.0
Gypsum	96.0	96.3
Dolomite	96.3	97.3

	Top Feet	Bottom Feet
Gypsum and dolomite	97.3	101.0
Dolomite	101.0	114.6
Anhydrite	114.6	122.6
Dolomite	122.6	139.7
Anhydrite and dolomite	139.7	144.8
Dolomite with thin anhydrite partings	144.8	204.7
Anhydrite	204.7	207.5
Dolomite with thin anhydrite partings	207.5	248.8
Dolomite	248.8	325.9
Anhydrite and dolomite	325.9	331.4
Dolomite	331.4	339.9
Anhydrite - some dolomite	339.9	343.7
Dolomite	343.7	420.0
Anhydrite	420.0	436.5
Dolomite	436.5	440.0
Anhydrite and dolomite	440.0	459.8
Dolomite - standing water level	459.8	462.0
Anhydrite	462.0	463.7
Dark and porous dolomite - trace of gas and petroleum	463.7	483.0
Porous dolomite and gas	483.0	500.0

Note: Tymochtee - Greenfield contact at 460 feet.

This is the last stop. From here, those going :

West: continue west on Ohio 2 to Port Clinton,

South: retrace route east and south on Ohio 2 across Sandusky Bay bridge to:

Ohio 4 for southwest,

U.S. 250 for southeast,

U.S. 20 or Ohio 2 for east.

For the information of any eager beavers in the crowd, outcrops of the Detroit River Group (Raisin River and Put-In-Bay) occur on the north end of Catawba Point.

It's been nice having you with us ------ See you next year ------

DRIVE CAREFULLY AND ARRIVE HOME SAFELY

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